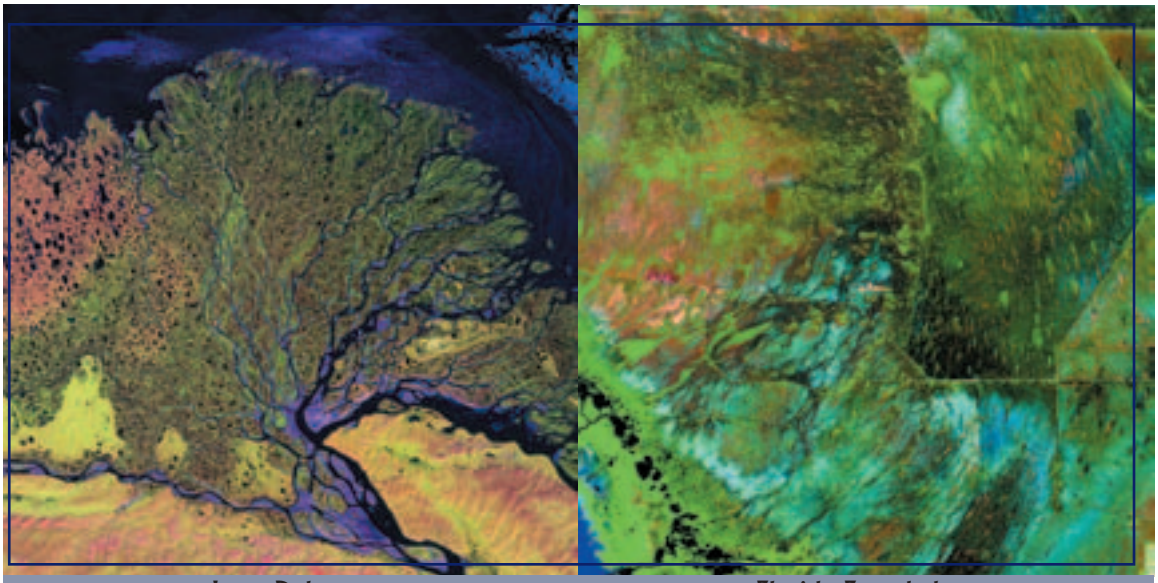
# The Laboratory for Terrestrial Physics

## 2002 Annual Report



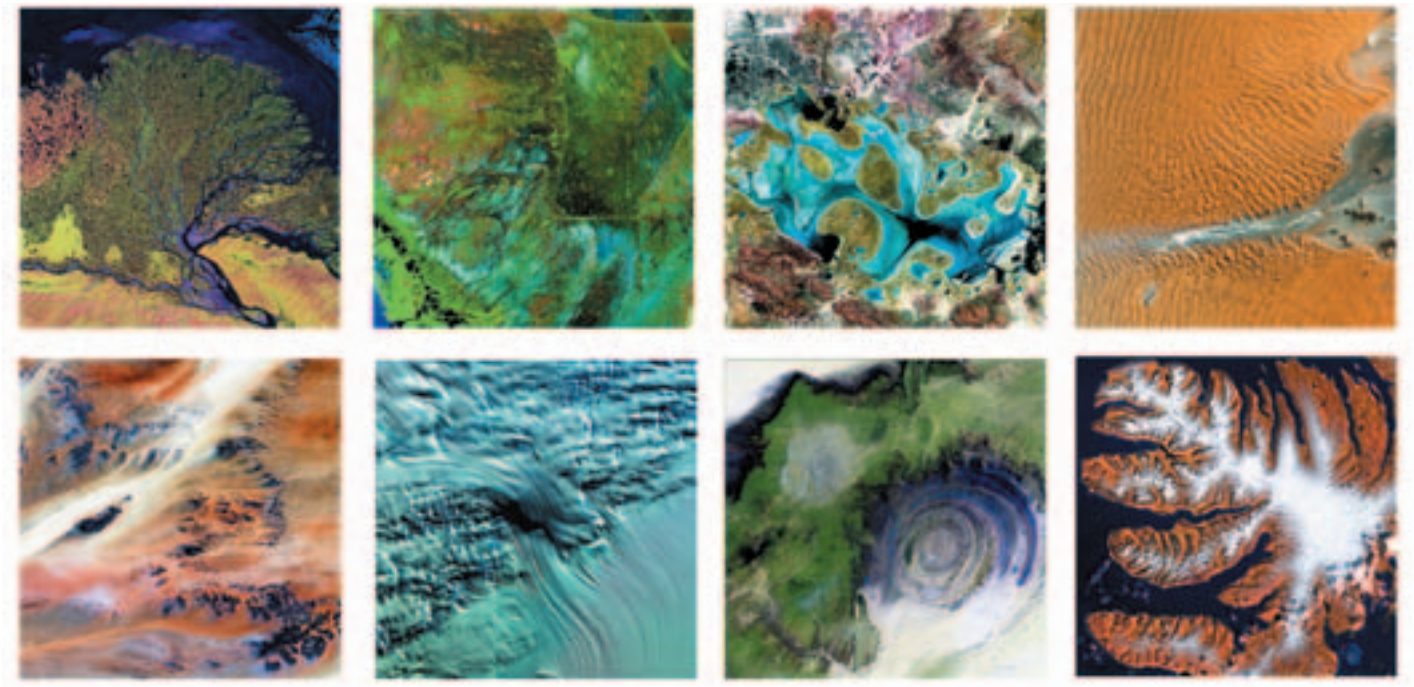
Lena Delta | Florida Everglades

***Celebrating 30 Years of Continuous Landsat Global Coverage!***

Lake Carnegie | Namib Desert

NASA Goddard Space Flight Center
Greenbelt, MD 20771

# Laboratory for Terrestrial Physics
NASA Goddard Space Flight Center



***The cover of the Laboratory for Terrestrial Physics 2002 Annual Report honors the 30th Anniversary of Landsat! See the next page for a description of the proud role that LTP scientists have played in the history of Landsat!***

The images on the front and back covers of this Report are a part of the Landsat-7: Earth as Art exhibit. This exhibit concept was initiated by the USGS EROS Data Center to commemorate the 30th anniversary of the Landsat program. It consists of approximately 40 images of different areas of the world - from deserts to lakes, from man-made features to natural ones, from ice and snow to cloud features. Various combinations of the Landsat 7 spectral bands were selected to create the vivid RGB (and often false color) composites. The images were selected on the basis of aesthetic appeal, and use the visceral avenue of art to convey the thrilling perspective of the Earth that Landsat provides to the viewer.

Members of the Laboratory for Terrestrial Physics worked with the USGS to reproduce and distribute the exhibit to high visibility areas. During 2002, the Earth as Art exhibit was on display at NASA Headquarters, the Library of Congress in Washington, DC, and at several other venues throughout the country. An on-line exhibit of the images can be viewed at http://landsat.gsfc.nasa.gov/earthasart/

All 8 cover images are shown above:

Top (L-R): The Lena Delta in Russia, the Florida Everglades in the United States, Lake Carnegie in Western Australia, and the Namib Desert in Namibia, Africa.

Bottom (L-R): The Terkezi Oasis in Chad, Africa, Lambert Glacier in Antarctia, the Richat Structure in Mauritania, Africa, and the West Fjords in Iceland.

## *The Lab for Terrestrial Physics Role in Landsat History*

The Laboratory for Terrestrial Physics (LTP) has made significant contributions to the success of the Landsat Program, particularly in the area of ensuring the scientific integrity of the various missions. In the mid 1970s, Dr. Louis Walter, the Code 920 Division Chief at that time, was the Study Scientist leading the development of the specifications for the new Thematic Mapper instrument to improve upon the early successes realized with the original Multispectral Scanner instrument. Dr. Vincent Salomonson followed Dr. Walter as both the next 920 Lab Chief and as the Landsat Project Scientist overseeing the development of the Landsat 4 and 5 missions in the late 1970s and early 1980s. Drs. John Barker and Darrel Williams of the Biospheric Sciences Branch (BSB) supported Dr. Salomonson as Associate and Assistant Project Scientists, respectively. With the return of Landsat oversight to NASA in 1992, Dr. Williams, Head of the BSB at that time, was appointed Project Scientist for Landsat 7, with Dr. James Irons of the BSB serving as Deputy Project Scientist and Dr. Barker once again serving as Associate. Mr. Brian Markham of the BSB has substantially contributed to the calibration of the Landsat instruments and has served as the Calibration Scientist for Landsat 7. Dr. Irons is continuing the LTP and BSB tradition by serving as the Project Scientist for the next generation Landsat mission, known as the Landsat Data Continuity Mission or LDCM.

## *Contained In This Report...*

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# Introduction

Thank you for taking the time to acquaint yourself with the Laboratory for Terrestrial Physics and our accomplishments for 2002!

The Laboratory advances NASA programs through the exploration of Earth and planetary solid-body physics. These explorations involve the physics and dynamics of the Earth, as well as of the planets and their satellites. The Lab's innovative and exciting programs study the global properties of the solid Earth, global and regional scale vegetation monitoring, biosphere-atmosphere interactions, and laser remote sensing.

The Laboratory's Biospheric Sciences program encompasses a broad range of basic and applied research to study terrestrial ecosystems and their interactions with the atmosphere using multi-scale remote sensing, modeling, and advanced analytical techniques. Experiments and investigations utilizing new techniques and capabilities enhance our understanding of global processes for Earth System Science.

The Laboratory's "geophysical and geodynamic" studies span a wide range of subjects in the research of both the Earth and solid planetary bodies, especially Mars. Present-day measurements using both surface and satellite data, models derived from these, and other observational and theoretical information, are used to help improve our understanding of the evolution of the core, mantle and crust, and their interactions with surface topography.

The Laboratory's laser measurement research studies new techniques based on analysis and tests with airborne and spaceborne instruments. Accordingly, this area links the scientific requirements to define, design, build, and demonstrate instruments for Earth and planetary remote-sensing science programs. The laser research itself is focused on improving the understanding of electro-optical sensor physics, and the propagation environment. Additional technological skills are employed in the development of advance techniques for defining subsystem performance through the development and engineering of flight instruments, and the calibration and characterization of these instruments in realistic environments.

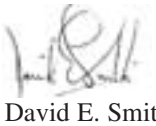
The Laboratory's information processing research focuses on developing reliable, low-cost computing systems for the production, distribution, and analysis of regional and global data sets. The Laboratory's information technology improves the security and reliability of the computing environment.

Ultimately, our activities result in the advance of scientific knowledge. To this point, the Laboratory relies on its key personnel - its scientists and researchers - to report their results in conferences, symposia, and publications. Interaction with the national and international scientific community is essential, and integrally a part of our Laboratory's efforts.

This comprehensive report includes our philosophy, an overview of our dedicated staff, and descriptions of our projects, with synopses of the Laboratory's achievements and accomplishments for 2002. This report encompasses the Laboratory's dedication to human resources, their scientific interactions, and outreach activities with the outside community.

Please take some time to peruse this report, and contact me or my staff if you have any questions, concerns, or comments.

Sincerely,



David E. Smith
Chief, Laboratory for Terrestrial Physics

## Our Mission and Place within NASA

Mission: The Laboratory for Terrestrial Physics is dedicated to the advancement of knowledge in Earth and planetary science, by conducting innovative research using space technology.

The Laboratory's mission and activities support the work and new initiatives at NASA's Goddard Space Flight Center (GSFC). The Laboratory's success contributes to the Earth Science Directorate as a national resource for studies of Earth from Space. The Laboratory is part of the Earth Science Directorate based at the GSFC in Greenbelt, MD. The Directorate itself is comprised of the Global Change Data Center (GCDC), the Space Data and Computing Division (SDCD), and four science Laboratories, including Laboratory for Terrestrial Physics, Laboratory for Atmospheres, and Laboratory for Hydrospheric Processes all in Greenbelt, MD. The fourth research organization, Goddard Institute for Space Studies (GISS), is in New York, NY.

Relevant to NASA's Strategic Plan, the Laboratory ensures that all work undertaken and completed is within the vision of GSFC. The philosophy of the Laboratory is to balance the completion of near term goals, while building on the Laboratory's achievements as a foundation for the scientific challenges in the future.

For your convenience, we have published this report on the Internet at the following link: http://ltpwww.gsfc.nasa.gov/

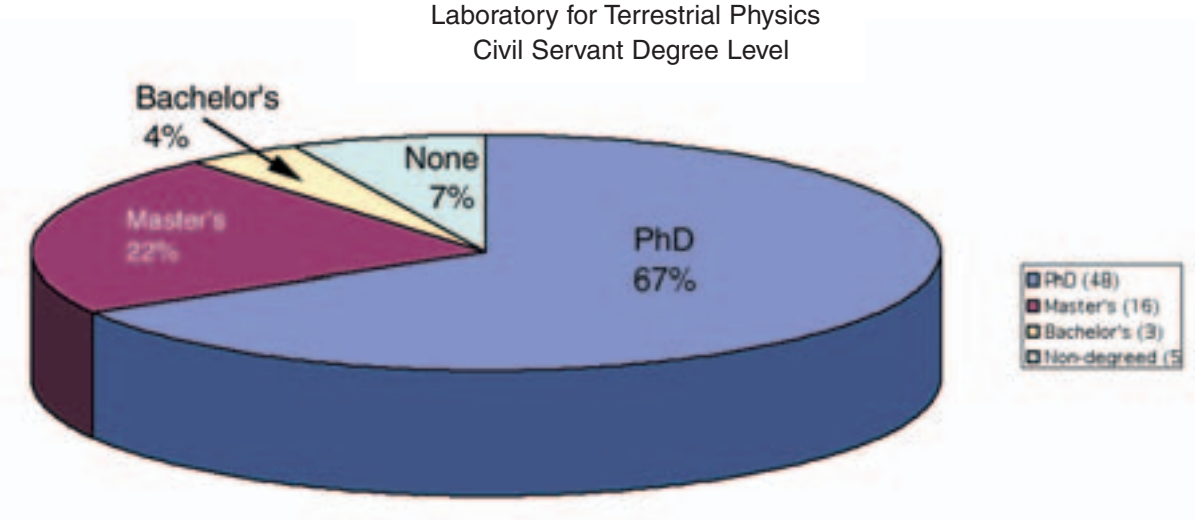
# Organizational Structure

The Laboratory for Terrestrial Physics is one of 3 scientific divisions within the Earth Sciences Directorate, sharing research with the Laboratory for Hydrospheric Processes and Laboratory for Atmospheres, and the Goddard Institute for Space Studies.

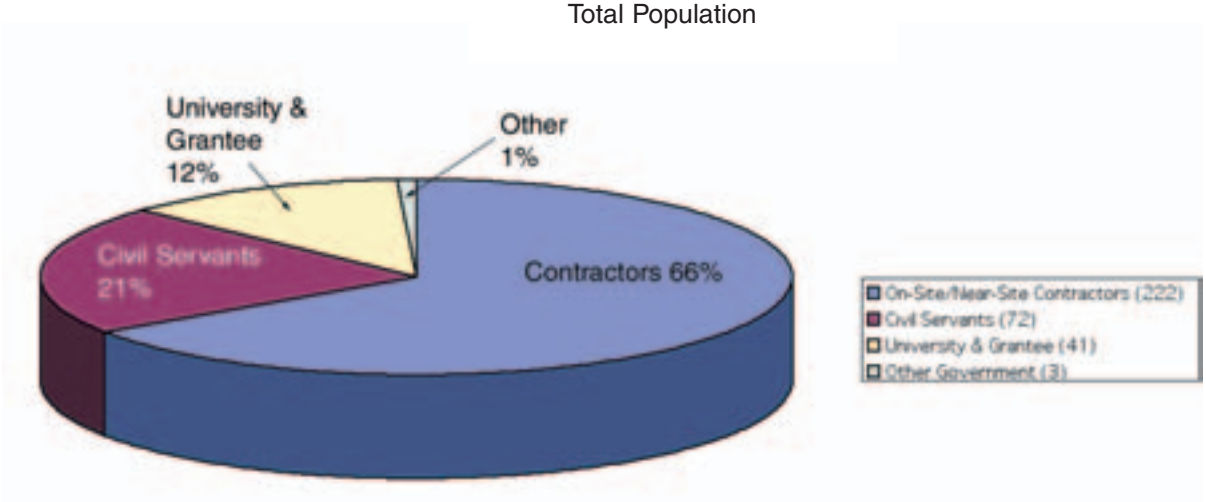
## Staff

The Laboratory hosts 72 civil servants (67 full-time permanent), and 243 supporting contractors, which are on site or near site. University grants and cooperative agreements draw 37 additional scientists and technologists. There are 3 additional employees from other government agencies who are long-term residents within the Laboratory. The average age of a Laboratory civil servant is 50, and the average age of all professionals is 51. Ages range from 26 (secretary) or 33 (researcher) to 76. For the civil servants within the Laboratory, the average length of government service is over 20 years; a majority of those have spent their entire time within the Laboratory. This may be taken as an indicator that the Laboratory is a "good place to work."

Laboratory for Terrestrial Physics
Civil Servant Degree Level



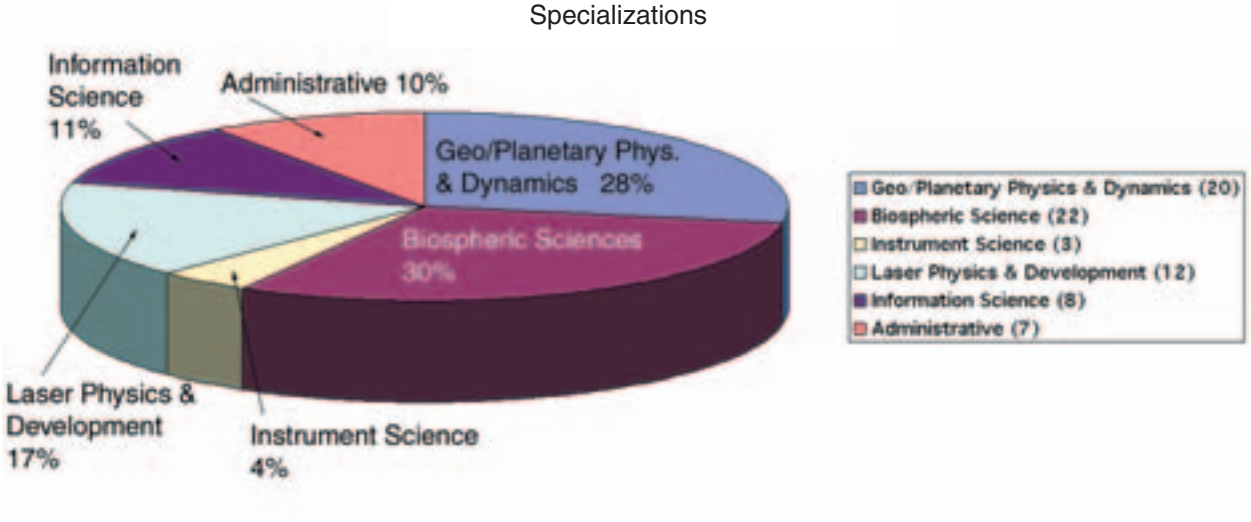

Laboratory for Terrestrial Physics
Total Population



## Organizational Structure

There are many different professional skills represented within the Laboratory. As a gross summary, there are 20 researchers in geo/planetary physics and dynamics; 19 in biospheric sciences; 9 in laser physics and development; and 7 each in instrument science and information science. Additionally, there are 10 employees who devote the majority of their time to administrative tasks, from project science to office administration.

Laboratory for Terrestrial Physics
Specializations




The Laboratory is composed of 5 branches, 2 offices, 4 staff scientists, and a large number of cooperating institutions. Particularly notable in the latter category are MIT, University of Maryland at College Park, University of Maryland Baltimore Campus; Scripps Institute of Oceanography (one Laboratory employee is permanently located there), the U.S. Geological Survey, and International Laser Ranging and Very Long Baseline Interferometer services. Branches range in size from 7 to 20 employees; offices from 3 to 5.